SPECIFICATION TITTLE

METROLOGY CALIBRATION PROCEDURE FOR THE

COMMUNICATIONS TECHNOLOGY DAVAR 50

GTE

EQUIPMENT SERVICES CENTER

METROLOGY DEPARTMENT

PRODUCTION ENGINEERING - ESC		
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TEMPORARY MAINTENANCE NOTE:

FOR THE
COMMUNICATIONS TECHNOLOGY
DAVAR 50 and DAVAR 200

Description:

The UUT must have firmware revision (D50C = 1.05; D200C = 1.07) or higher installed. A UUT with an earlier firmware version must be turned in for modification by Communications Technology prior to calibration and subsequent field use. Both hardware and firmware will be modified to enable the UUT to meet the specifications listed in table 3-1 of GTE, ERS California, Metrology Calibration Procedure EPC-900.003. The specifications listed are a GTE, ERS California, Metrology assigned compilation based on laboratory evaluation, Communications Technology, DaVaR Sysytem III Operations manual, and Communications Technology, "RECOMMENDED SPECIFICATION CHANGE", 6/20/91:jhs.

Procedure:

1. Turn the UUT on.
2. Perform the following key press sequence: ID, ID.
3. Observe the UUT's firmware version.
4. If the UUT's firmware version is 1.05 or greater proceed with the calibration/maintenance/use of the unit. If the UUT firmware version is previous to 1.05 contact the ERS for disposition of the unit.

Sid Harp — Approved by

9-25-91 — Date issued

ISSUE STATUS SPECIFICATION

EPC 900.003

RELATED SPECIFICATIONS	CURRENT ISSUES & STATUS
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EPC 900.003-EPS	N/A
EPC 900.003-TRS	N/A
EPC 900.003-RPS	N/A
EPC 900.003-XRF	N/A
EPC 900.003-PSS	N/A
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METROLOGY CALIBRATION PROCEDURE

COMMUNICATIONS TECHNOLOGY CORP.

DAVAR 50

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EPC-900.003

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1.0 PREPARATORY INFORMATION

1.1 This document describes an approved method of calibration for the Communications Technology Corporation model Davar 50, firmware revision (D50C = 1.05; D200C = 1.07) or higher hereafter referred to as the Unit Under Test (UUT).

1.2 Unless otherwise specified on the Calibration Data Sheet/s it may be assumed that the standards used in the performance of this MCP meet or exceed a 4:1 tolerance uncertainty ratio with the UUT.

1.3 Throughout this procedure you will be instructed to "RECORD" data on the Calibration Data Sheets. If the customer does not require recorded data the instruction to "RECORD" data may be interpreted as requiring the technician to utilize the Calibration Data Sheet as a reference for UUT tolerances.

2.0 PRELIMINARY REQUIREMENTS

2.1 Refer to table 2-1 for a list of the standards recommended for use with this procedure. These are standards known to be available at the time of this writing. Any laboratory standard with the required accuracy ratio may be used in place of the standards listed.

Standard Requirements:	**Recommended Standards:**
DC Voltage Calibrator: Range: 0 to 250 VDC Accuracy: +/- 0.25% I.V.	**5100B** Fluke
AC Signal Source: 15 dB @ 577 Hz (Reference only)	**5100B** Fluke
Decade Resistor: Range: 40kΩ to 1.2MΩ Accuracy: +/-0. 25%	**1432 or 1433 Models** General Radio
Decade Capacitor: Range: .083 ufd Accuracy: +/- 0.5%	**1412 or 1419 Models** General Radio
Oscilloscope: Accuracy:(Reference only)	**2430** Tektronix
Special Equipment of local stock/manufacturer:	
Loop-Back Test Plug *(see attachment 1)* or similar cable	Local Mfr
Trouble Simulator *(see attachment 2)* or similar cable	Local Mfr
Cable Network Simmulation Modules	Local Stock
Two Headsets or two Telephone Handsets	Local Stock

NOTE: *ACCURACIES LISTED ARE THOSE REQUIRED FOR A 4:1 T.U.R.*

Table 2-1. Recommended Standards and Standards Requirements

3.0 EQUIPMENT SPECIFICATIONS

3.1 Table 3-1 lists the UUT's specifications.

3.2 Visual Inspection

3.2.1 Perform a visual inspection of the UUT for signs of physical damage that might create a hazardous condition in use.

3.3 Cleaning

3.3.1 Clean the UUT exterior with a soft cloth dampened in a mild solution of detergent and water. Do not attempt to clean the UUT interior.

DC VOLTMETER:
Range: +/- (0 to 250VDC)
Accuracy: (0 to 75VDC) +/- 1% I.V.
(75 to 250VDC) +/- 2% I.V.

OHMMETER:
Range: +/- (0 to 1.5 Mohms)
Accuracy: (0 to 100KΩ) +/- 1% I.V.
(100K to 330KΩ) +/- 2% I.V.
(330K to 1.5MΩ) +/- 5% I.V.

CAPACITANCE METER:
Accuracy:
(200' TO 8,000') +/- (2% I.V. + 1 count)
(>8,000 feet) +/- (4% I.V. + 1 count)

IMPEADANCE METER:
Range: 0 to 80 kFt @ 500 to 1500 Hz
Accuracy: +/- 5% I.V.
+/- 3% I.V. @ 1 kHz

LOAD COIL MEASUREMENTS:
Range: 1 to 6 loads
Measured Value:
Accuracy: (1 to 4 loads) +/- 5% I.V.
(4 to 6 loads) +/- 10% I.V.
Spacing:
Accuracy: (1 to 4 loads) +/- 5% I.V.
(4 to 6 loads) +/- 10% I.V.
Sections:
Front: 2,700 to 3,300 feet
End: >4500 feet

TONE GENERATOR:
Output Frequency: 577Hz
Accuracy: +/- 2% of I.V.
Level: 15 dBm
Interrupted: 100 mS on and 200 mS off
Impedance: 600 Ohms

METALLIC NOISE:
Accuracy: 0 to 10 dBrn +/- 3 dB
10 to 50 dBrn +/- 1 dB

POWER INFLUENCE:
Accuracy: 30 to 40 dBrn +/- 3 dB
40 to 100 dBrn +/- 1 dB

INSERTION LOSS:
Range: 5 to -40 dBm
Accuracy: @ 1 kHz +/- .5 dB
@ 200 to 4800 Hz +/- .7 dB

See paragraph 6.3 for Specification origins.

Table 3-1. UUT specifications. *(refer to the Manufacturer's manual for complete specifications.)*

4.0 CALIBRATION

NOTE: The UUT should be fully charged for 24 hrs prior to calibration. The Davar 50 and CAS 2000 will indicate false troubles when batteries are low, even before low battery indications are displayed. A functional printer is required for calibration. Unlock the UUT's printer and verify that the printer has paper and is properly fed. Refer to section 2.3.03 and 2.3.04 of "DAVAR SYSTEM III OPERATIONS MANUAL" for paper installation and printer operation.

4.1 Self Tests

4.1.1 Make the following observations and record PASS on the Calibration Data Sheet if all criterion are met:

1. Turn the UUT on and set volume control knob to mid range.
   A. An audible tone should be heard briefly.
   B. No abnormal UUT display segments or indications, ie; segments out, flashing segments ect.

.2 Make the following observations and record PASS on the Calibration Data Sheet if all criterion are met:

1. Press the UUT's print key. The printer's ON indicator should illuminate.
2. Toggle the printer's FEED switch a few times, paper should feed.
3. Press the UUT DELETE key. The printer's "ON" indicator should extinguish.

STEP	MEASUREMENT	TOLERANCE
4.1.1	SYSTEM TEST	PASS/FAIL
4.1.2	PRINTER TEST	PASS/FAIL

4.2 Auto Buzz Tests

4.2.1 Initialization

4.2.1.1 Perform the following key press (refers to keys on the UUT's keypad)sequence to delete bridging on all pairs: STOP, AUTO, DELETE, START. UUT will display: "DELETING ALL". a few seconds will be required for the UUT to execute this program. (this step is required to unbridge any pairs that may be randomly bridged when the UUT is turned off).

4.2.2 Opens Test

4.2.2.1 Perform the following key press sequence: AUTO, CONT, START, START, START, START. The UUT will initiate auto testing of old to new pairs.

.2 Allow the UUT to complete the program initiated in step 4.2.2.1 then observe the UUT's print out and the one displayed in figure 4-1.

UUT PRINT OUTS FOR AUTO BUZZ TESTS

```
DAVAR 50 SYSTEM III
VER 1.02 00.07.02:26

EXT BUZZ
01:    SPL 01:  OPEN
02:    SPL 02:  OPEN
03:    SPL 03:  OPEN
04:    SPL 04:  OPEN
05:    SPL 05:  OPEN
06:    SPL 06:  OPEN
07:    SPL 07:  OPEN
08:    SPL 08:  OPEN
09:    SPL 09:  OPEN
10:    SPL 10:  OPEN
11:    SPL 11:  OPEN
12:    SPL 12:  OPEN
13:    SPL 13:  OPEN
14:    SPL 14:  OPEN
15:    SPL 15:  OPEN
16:    SPL 16:  OPEN
17:    SPL 17:  OPEN
18:    SPL 18:  OPEN
19:    SPL 19:  OPEN
20:    SPL 20:  OPEN
21:    SPL 21:  OPEN
22:    SPL 22:  OPEN
23:    SPL 23:  OPEN
24:    SPL 24:  OPEN
25:    SPL 25:  OPEN
Complete  00.07.02:29
```

Figure 4-1. Opens Test

```
DAVAR 50 SYSTEM III
VER 1.02 00.07.02:26

EXT BUZZ
01:    SPL 01:  BUZZ
02:    SPL 02:  BUZZ
03:    SPL 03:  BUZZ
04:    SPL 04:  BUZZ
05:    SPL 05:  BUZZ
06:    SPL 06:  BUZZ
07:    SPL 07:  BUZZ
08:    SPL 08:  BUZZ
09:    SPL 09:  BUZZ
10:    SPL 10:  BUZZ
11:    SPL 11:  BUZZ
12:    SPL 12:  BUZZ
13:    SPL 13:  BUZZ
14:    SPL 14:  BUZZ
15:    SPL 15:  BUZZ
16:    SPL 16:  BUZZ
17:    SPL 17:  BUZZ
18:    SPL 18:  BUZZ
19:    SPL 19:  BUZZ
20:    SPL 20:  BUZZ
21:    SPL 21:  BUZZ
22:    SPL 22:  BUZZ
23:    SPL 23:  BUZZ
24:    SPL 24:  BUZZ
25:    SPL 25:  BUZZ
Complete  00.07.02:29
```

Figure 4-2. Bridge and Loop-Back Tests

```
NOTE: PAIR 21
MAY BE T GND
OR R GND

DAVAR 50 SYSTEM III
VER 1.02 00.07.02:26

EXT BUZZ
01:    SPL 01:  BUZZ
02:    SPL 02:COL:RV
03:    SPL 03:  BUZZ
04: SHORT 04: SHORT
05:    SPL 05:  BUZZ
06: SHORT 06:  BUZZ
07:    SPL 07:  BUZZ
08:    SPL 08:T:OPEN
09:    SPL 09:  BUZZ
10:    SPL 10:R:OPEN
11:    SPL 11:  BUZZ
12:    SPL 12:  OPEN
13:    SPL 13:  BUZZ
14:    SPL 15:R:CROS
15:    SPL 14:T:CROS
16:    SPL 16:  BUZZ
17:  T GND 17:T:OPEN
18:    SPL 18:  BUZZ
19:  R GND 19:R:OPEN
20:    SPL 20:  BUZZ
21:  R GND 21:T:OPEN
22:    SPL 22:  BUZZ
23:    SPL 23:  BUZZ
24:    SPL 25:  XPSD
25:    SPL 24:  XPSD
Complete  00.07.02:29
```

Figure 4-3. Troubles Test

.3 Perform the following observations and record PASS on the Calibration Data Sheet if all criterion are met:
1. all pair's test results indicate "OPEN"
2. The results of 25 pair tests are printed.
3. The UUT's print out format matches that of the one displayed in figure 4-1.

STEP	MEASUREMENT	TOLERANCE
4.2.2.3	OPEN TEST	PASS/FAIL

4.2.3 Bridge Test

4.2.3.1 Upon completion of the program executed in step 4.2.2.1 the UUT should display "SELECT PROGRAM", if it does not make the following key press: STOP.

.2 Perform the following key press sequence: AUTO, BRIDGE, START. The UUT will display "BRIDGING ALL PAIRS" followed by "STANDBY" while bridging relays operate.

.3 Allow the UUT to complete the program initiated in step 4.2.3.2. This will take approximately 20 to 30 seconds. (if "DELETE PR XX" is displayed the UUT will require a battery charge.) The UUT will print a row of dots accross the top of the display when the program is finished (all pairs bridged).

.4 Perform the following key press sequence: AUTO, CONT, START, START, START, START. The UUT will initiate the Automatic Buzz Test program.

.5 Allow the UUT to complete the program initiated in step 4.2.3.4 then observe the UUT's print out and the one displayed in figure 4-2.

.6 Make the following observations and record PASS on the Calibration Data Sheet if all criterion are met:
1. all pair's test results indicate "BUZZ" .
2. The results of 25 pair tests are printed.
3. The UUT's print out format matches that of the one displayed in figure 4-2.

.7 De-bridge all pairs with the following key press sequence: STOP, AUTO, DELETE, START (row of spaced dots on display should dissapear).

STEP	MEASUREMENT	TOLERANCE
4.2.3.6	BRIDGE TEST	PASS/FAIL

4.2.4 Loop-back Test

4.2.4.1 Install the loop-back test plug (see attachment 1) between the UUT's OLD and NEW connectors.

.2 Perform the following key press sequence: STOP, AUTO, CONT, START, START, START, START. The UUT will again execute the Auto Buzz Test.

.3 Allow the UUT to complete the program initiated in step 4.2.4.2 then observe the UUT's print out and the one displayed in figure 4-2.

.4 Make the following observations and record PASS on the Calibration Data Sheet if all criterion are met:
1. all pair's test results indicate "BUZZ".
2. The results of 25 pair tests are printed.
3. The UUT's print out format matches that of the one displayed in figure 4-2.

.5 Disconnect the Loop-back test plug from the UUT.

STEP	MEASUREMENT	TOLERANCE
4.2.4.4	LOOP-BACK TEST	PASS/FAIL

4.2.5 Simmulated Troubles Test

4.2.5.1 Install the Trouble Simmulation plug (see attachment 2) between the UUT's OLD and NEW connectors.

.2 Connect the Trouble Simmulation plug's ground terminal/cable to the UUT's ground terminal.

.3 Perform the following key press sequence: STOP, AUTO, CONT, START, START, START, START. The UUT will yet again execute the Auto Buzz Test.

.4 Allow the UUT to complete the program initiated in step 4.2.5.3 then observe the UUT's print out and the one displayed in figure 4-3.

.5 Make the following observations and record PASS on the Calibration Data Sheet if all criterion are met:
1. The results of 25 Pair Tests are printed.
2. all pair's test results match those listed in figure 4-3 (the only exception is that pair 21 may indicate "T GND" OR "R GND".
3. The UUT's print out format matches that of the one displayed in figure 4-3.

.6 Disconnect the Trouble Simmulation plug from the UUT.

STEP	MEASUREMENT	TOLERANCE
4.2.5.5	SIMMULATED TROUBLES TEST	PASS/FAIL

4.3 TONE, PROBE and TRACE TONE TESTS

4.3.1 Trace Tone Detection with the Amp Probe

4.3.1.1 Connect the equipment as shown in figure 4-4.

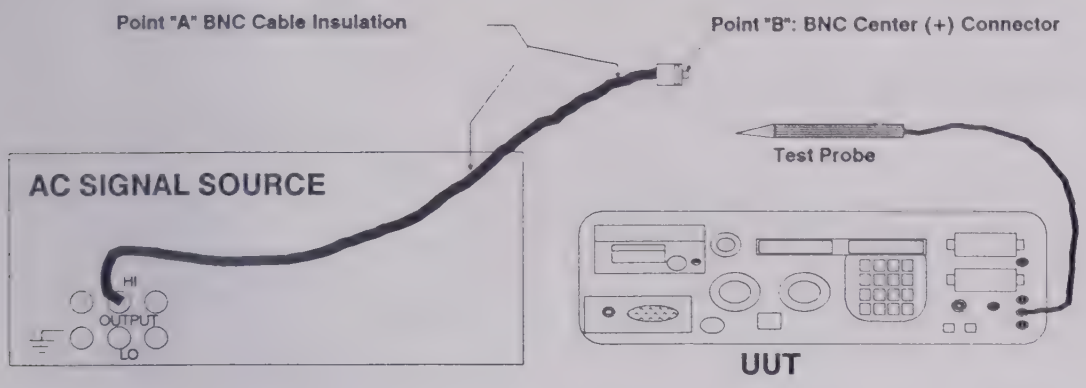


Figure 4-4. Trace Tone Detection With the Amp Probe

4.3.1.2 configure the AC Signal Source to output 600 Hz @ +10 dB.

.3 Set the UUT volume control to approximately mid-range.

.4 Perform the following key press sequence: STOP, ID, TONE (the UUT display should indicate "AMP PROBE").

.5 Make the following observations and record PASS on the Calibration Data Sheet if all criterion are met:

1. Place the UUT's Amp Probe tip at approximately point "A" as displayed in figure 4-4.
   A. An audible tone should now be heard from the UUT's speaker (tone will only be present while Probe tip to cable close proximity/contact is maintained).
2. Place the UUT's Amp Probe tip at approximately point "B" as displayed in figure 4-4.
   A. An audible tone should now be heard from the UUT's speaker that is noticably louder than that observed when the UUT's probe tip was at point "A" (Probe tip must be in contact with exposed cable end).

.6 Disconnect amp probe from amp jack.

STEP	MEASUREMENT	TOLERANCE
4.3.1.5	TRACE TONE DETECTION WITH THE AMP PROBE	PASS/FAIL

4.3.2 Sending Tone on Old Pair Number 0

4.3.2.1 Connect the equipment as shown in figure 4-5.

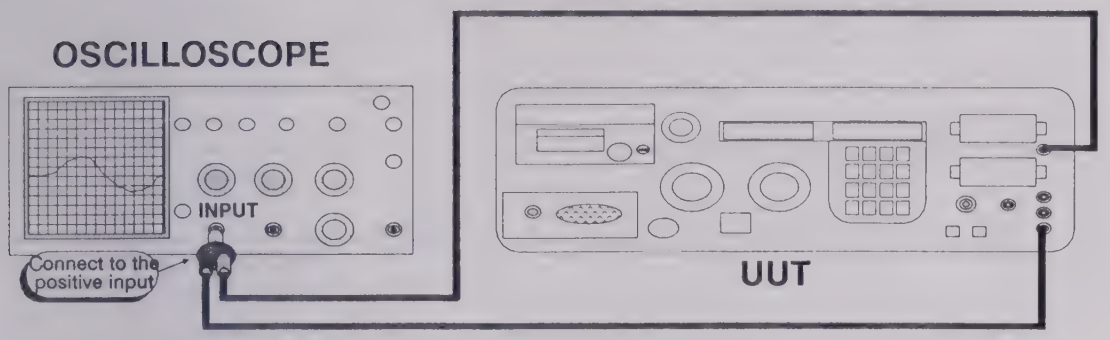


Figure 4-5. Sending Tone on Old Pair Number 0

4.3.2.2 Set the UUT's "OLD" Rotary switch to pair 0.

.3 Perform the following key press sequence: STOP, TONE, OLD,START(this will place a 577 Hz, interrupted tone @ +15 dB on the Tip and Ring leads of what ever pair the UUT's "OLD" rotary switch is set to).

.4 Measure the frequency of the Tone Signal at the UUT Pair 0 jack using the oscilloscope (a frequency counter will be unable to accurately measure the frequency of this signal as a result of 100 mS interruption).

.5 Record PASS on the Calibration Data Sheet if the indication obtained from the Oscilloscope is approximately 577 Hz.

.6 Observe the Oscilloscope display (configured as neccessary) and record PASS on the Calibration Data Sheet if the interruption is present and has a duration of approximately 100mS (Some versions of the Davar 50 will have a duration of 200mS)

.7 Observe the Oscilloscope display (configured as neccessary) indication and record PASS on the Calibration Data Sheet if the Tone Signal measured has an amplitude of approximately +15 dBm.

.8 Disconnect the equipment.

STEP	MEASUREMENT	TOLERANCE
4.3.2.5	PAIR 0 TONE FREQUENCY TEST	PASS/FAIL
4.3.2.6	PAIR 0 TONE INTERRUPTION TEST	PASS/FAIL
4.3.2.77	PAIR 0 TONE AMPLITUDE TEST	PASS/FAIL

4.3.3 Sending Tone on all Pairs (OLD and NEW)

NOTE: The following tests are intended as a functional test only. The UUT's Tone signal parameters have been verified in the previous section (4.3.2) and therefore, quantitative determinations are not required to verify proper UUT operation. It is the intention of this section to verify that no appreciable signal loss or distortion occurs.

4.3.3.1 Select the UUT's OLD rotary knob PAIR 1 position.

.2 When instructed to probe a pin, ensure that the test probe makes contact with only 1 pin at any given time.

.3 Make the following observations and record PASS on the Calibration Data Sheet if all criterion are met:

1. Probe the Pair 1 Ring pin (refer to figure 4-6 for a pin diagram) of the UUT OLD connector.
   A. The Tone signal should be present (approximately 577 Hz with 100 mS (or 200mS) interruption @ +15 dBm).
2. Select the UUT's OLD rotary knob PAIR 1 position.
3. Probe the Pair 1 Tip pin of the UUT OLD connector and verify that the Tone signal is present.
4. Select Each UUT OLD rotary knob Pair position and verify the presence of the Tone signal on Ring and Tip pins of the UUT OLD connector.
5. Press The UUT NEW key (Places Tone signal on the UUT NEW connector.
6. Select Each UUT NEW rotary knob Pair position and verify the presence of the Tone signal on Ring and Tip pins of the UUT NEW connector (refer to figure 4-6 for a pin diagram).

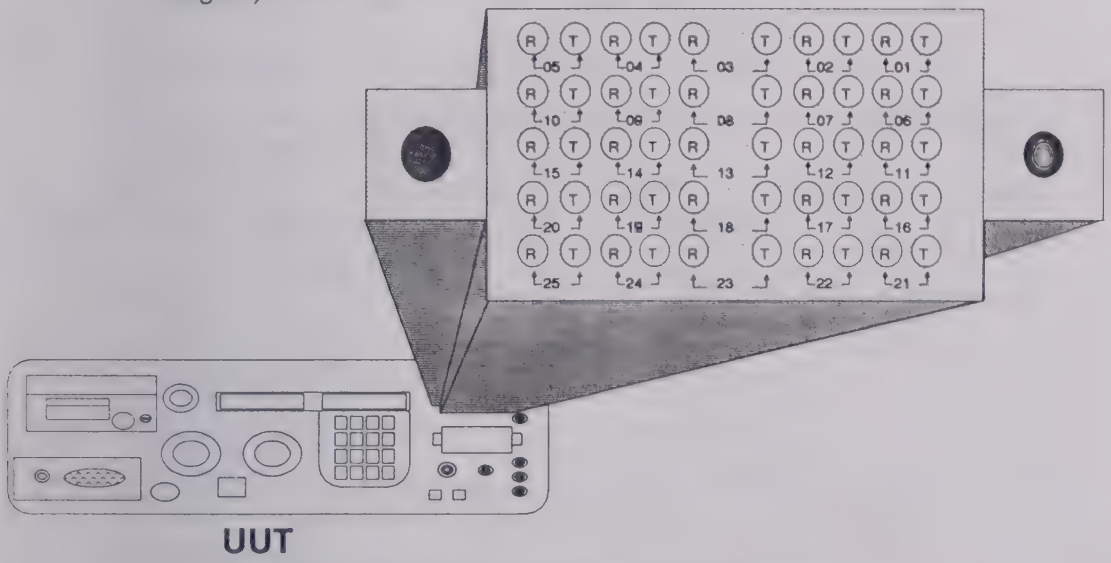


Figure 4-6. Sending Tone on All Pairs (OLD and NEW)

STEP	MEASUREMENT	TOLERANCE
4.3.3.3	SENDING TONE ON ALL PAIRS TEST	PASS/FAIL

4.4 METERING CIRCUITS TESTS

4.4.1 Voltmeter Tests

4.4.1.1 Connect the Equipment as shown in figure 4-7.

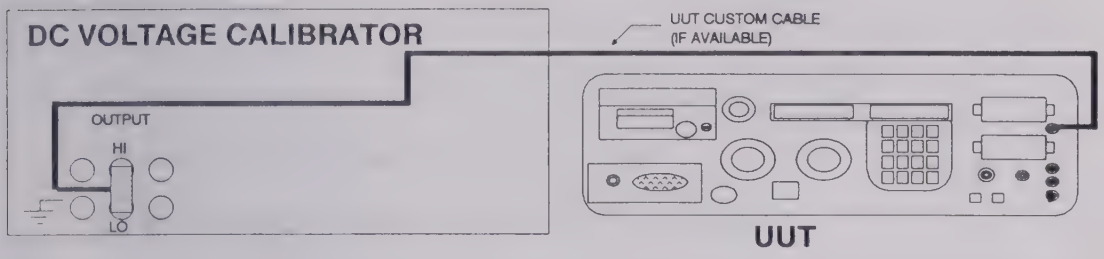


Figure 4-7. Voltmeter Tests

4.4.1.2 Perform the following key press sequence: STOP, VOLTS, OLD, and RT.

.3 Select pair 0 on the UUT OLD rotary switch.

.4 Program the DC Voltage Calibrator to output 25 VDC.

.5 Record The UUT indication on the Calibration Data Sheet.

.6 Use the Method described in steps 4.4.1.4 and 4.4.1.5 for each DC voltage value listed on the Calibration Data Sheet.

STEP	MEASUREMENT	TOLERANCE
4.4.1.5	0-75 VDC RANGE @ 25 V	24.8 to 25.2 VDC
4.4.1.6	0-75 VDC RANGE @ 50 V	49.5 to 50.5 VDC
4.4.1.6	0-75 VDC RANGE @ 74 V	73.3 to 74.7 VDC
4.4.1.6	75-250 VDC RANGE @ 80 V	78.4 to 81.6 VDC
4.4.1.6	75-250 VDC RANGE @ 245 V	240 to 250 VDC

4.4.2 Resistance Tests

4.4.2.1 Connect the Equipment as shown in figure 4-8.

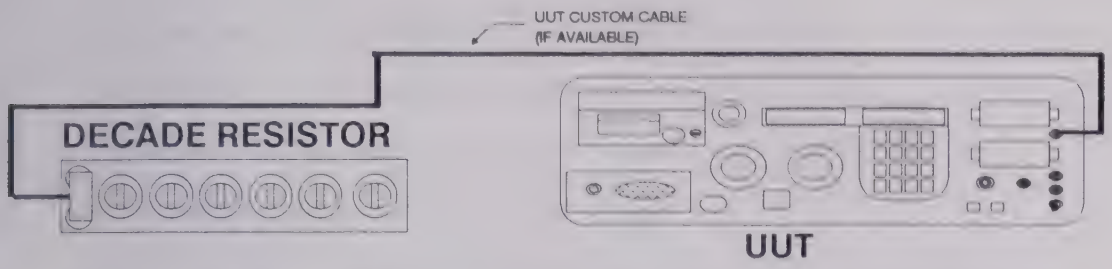


Figure 4-8. Resistance Tests

.2 Perform the following key press sequence: STOP, RES, OLD, and RT.

.3 Set the Decade Resistance Standard to 40 K Ohms.

.4 Record The UUT indication on the Calibration Data Sheet.

4.4.2.5 Use the Method described in steps 4.4.2.3 and 4.4.2.4 for each resistance value listed on the Calibration Data Sheet.

STEP	MEASUREMENT	TOLERANCE
4.4.2.4	0-100 kΩ RANGE @ 40 kΩ	39.6 to 40.4 kΩ
4.4.2.5	0-100 kΩ RANGE @ 90 kΩ	89.1 to 90.9 kΩ
4.4.2.5	100-330 kΩ RANGE @ 120 kΩ	118 to 122 kΩ
4.4.2.5	100-330 kΩ RANGE @ 200 kΩ	196 to 204 kΩ
4.4.2.5	100-330 kΩ RANGE @ 300 kΩ	294 to 306 kΩ
4.4.2.5	330k -1.5 MΩ RANGE @ 400 kΩ	380 to 420 kΩ
4.4.2.5	330k -1.5 MΩ RANGE @ 1.2 MΩ	1.14 to 1.26 MΩ

4.4.3 Capacitance Tests

4.4.3.1 Connect the equipment as shown in figure 4-9.

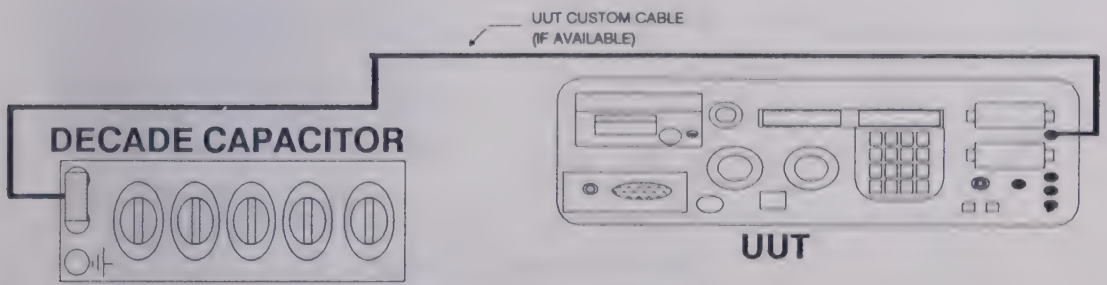


Figure 4-9. Capacitance Tests

4.4.3.2 Perform the Following key press sequence: STOP, REF, and ID.

.3 If the the UUT OLD display reads "KM ON" press the UUT START key.

.4 If the the UUT OLD display reads "KM OFF" press the UUT STOP key.

.5 Perform the following key press sequence: REF, CAP.

.6 If the UUT does not display "0.083 UF/MI" (United States Standard) then perform the following key press sequence: 8, 3, 0, START.

.7 Perform the following key press sequence: STOP, CAP, OLD, RT (selects the Capacitance and Distance modes).

.8 Set the Decade Capacitance Standard to .083 ufd.

.9 Record The UUT indication on the Calibration Data Sheet.

.10 Press the UUT REF key and record The UUT indication on the Calibration Data Sheet.

STEP	MEASUREMENT	TOLERANCE
4.4.3.9	200 - 8 kft RANGE @ 5.28 kft (.083 μf)	5.18 to 5.38 kft
4.4.3.10	200 - 8 kft RANGE @ 0.0830 μf	0.082 to 0.084 μf

4.4.4 Impedance Tests

NOTE: The following is an example and explination of a typical UUT display in the configuration used throughout this section:
UUT INDICATION: "0 F400 .475KZ:RT"
INTERPERTATION: Pair 0, Frequency = 400 Hz, Measured Impeadance = .475 KZ, Impeadance was measured RING to TIP.

4.4.4.1 Connect the Equipment as shown in figure 4-10.

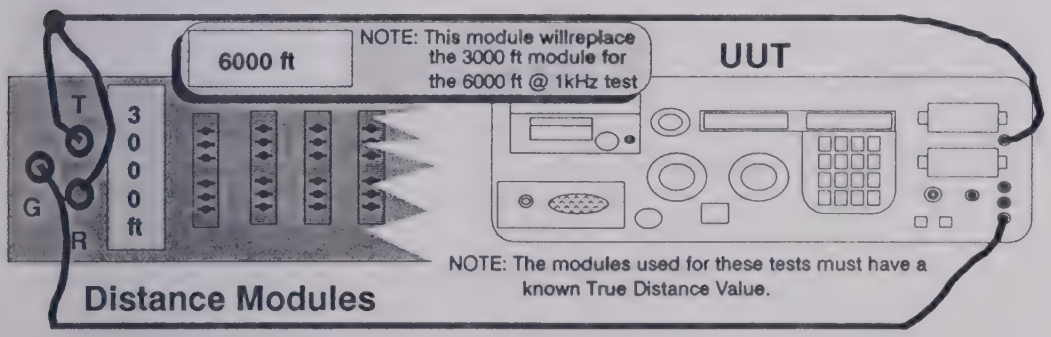

6000 ft
NOTE: This module willreplace the 3000 ft module for the 6000 ft @ 1kHz test
UUT
T
G
R
3000ft
NOTE: The modules used for these tests must have a known True Distance Value.
Distance Modules

Figure 4-10. Impeadance Tests

.2 Select pair 0 on the UUT OLD rotary switch.

4.4.4.3 Perform the following key press sequence: STOP, ID, RES, OLD, 1, 0, 0, 0, START.

.4 Record the reference impeadance value of the 3000' Distance Simmulator @ 1000 Hz on the Calibrattion Data Sheet as the NOMINAL VALUE for step 4.4.4.5 (this value will be used to calculate the UUT error).

.5 Record The UUT indication on the Calibration Data Sheet.

.6 The UUT's error may be calculated as a percentage of nominal as follows:
((UUT's Indication - NOMINAL VALUE) / NOMINAL VALUE) X 100

.7 Replace the 3000' Distance Module with the 6000' Distance Module then perform the following key press sequence: STOP, ID, RES, OLD, 1, 0, 0, 0, START.

.8 Record the reference impeadance value of the 6000' Distance Simmulator @ 1000 Hz on the Calibrattion Data Sheet as the NOMINAL VALUE for step 4.4.4.9.

.9 Record The UUT indication on the Calibration Data Sheet.

STEP	MEASUREMENT	TOLERANCE
4.4.4.5	3000 ft IMPEDANCE @ 1000 Hz	+/- 3% of Module's Reference Value
4.4.4.9	6000 ft IMPEDANCE @ 1000 Hz	+/- 3% of Module's Reference Value

4.4.5 Load Coil Measurements

4.4.5.1 Connect the equipment for a Three Load Configuration as shown in figure 4-11.

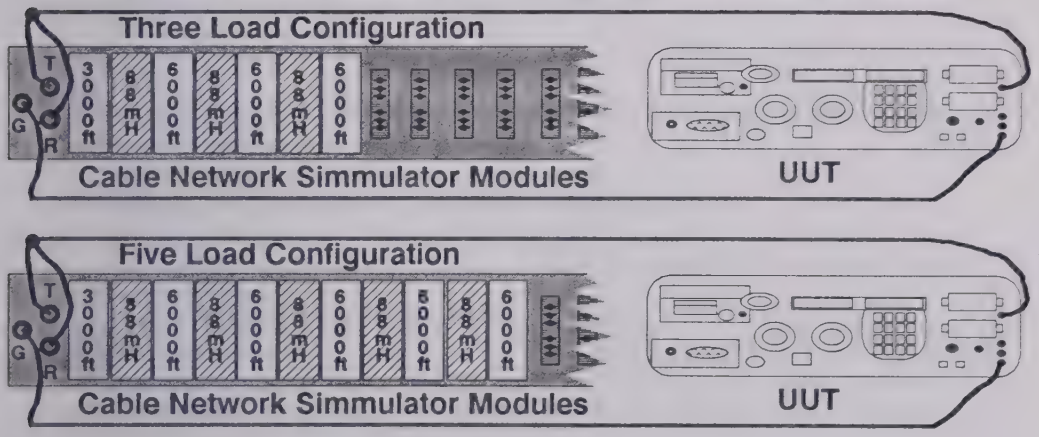


Figure 4-11. Load Coil Tests

.2 Set the UUT OLD PAIR rotary switch to the Pair 0 position.

.3 Perform the following UUT Key Press Sequence: MAN, RES, 3, START, OLD.

.4 The UUT will execute the test sequence program and print a report of the measured loads and distances.

4.4.5.5 Compare the UUT print out to the one displayed in figure 4-12.

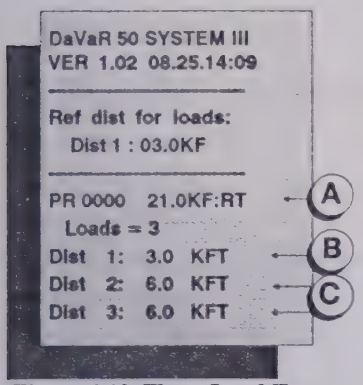


Figure 4-12. Three Load Test

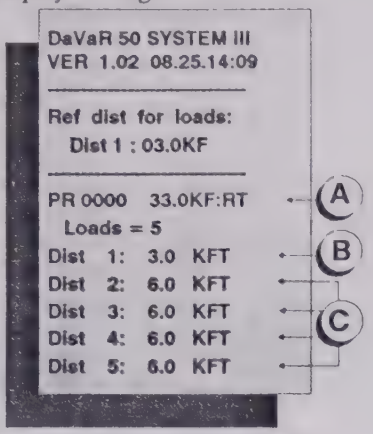


Figure 4-13. Five Load Test

.6 Make the following observations and record PASS on the Calibration Data Sheet if all criterion are met:.

1. The number of loads on the UUT print out equals 3.
2. The total distance ("A" in Figure 4-12) on the UUT print out equals 21,000 ft +/- 5%.
3. The distance ("B" in Figure 4-12) on the UUT print out equals 3000 ft +/- 5%.
4. The distance ("C" in Figure 4-12) on the UUT print out equals 6000 ft +/- 5%.

.7 Press the UUT RESET key.

.8 Connect the equipment for a Five Load Configuration as shown in figure 4-11.

.9 Perform the following UUT Key Press Sequence: MAN, RES, 3, START, OLD.

.10 The UUT will execute the test sequence program and print a report of the measured loads and distances.

.11 Compare the UUT print out to the one displayed in figure 4-13.

.12 Make the following observations and record PASS on the Calibration Data Sheet if all criterion are met:.

1. The number of loads on the UUT print out equals 5.
2. The total distance ("A" in Figure 4-13) on the UUT print out equals 33,000 ft +/- 10%.
3. The distance ("B" in Figure 4-13) on the UUT print out equals 3000 ft +/- 10%.
4. The distance ("C" in Figure 4-13) on the UUT print out equals 6000 ft +/- 10%.

STEP	MEASUREMENT	TOLERANCE
4.4.5.6	LOAD COIL TEST (THREE LOADS)	PASS/FAIL
4.4.5.12	LOAD COIL TEST (FIVE LOADS)	PASS/FAIL

4.5 Communications Tests

NOTE: If Telephone Hand Sets are used, switch them on and leave them on throughout this section.

4.5.1 Talk Connection test

4.5.1.1 Connect the equipment as shown in figure 4-14.

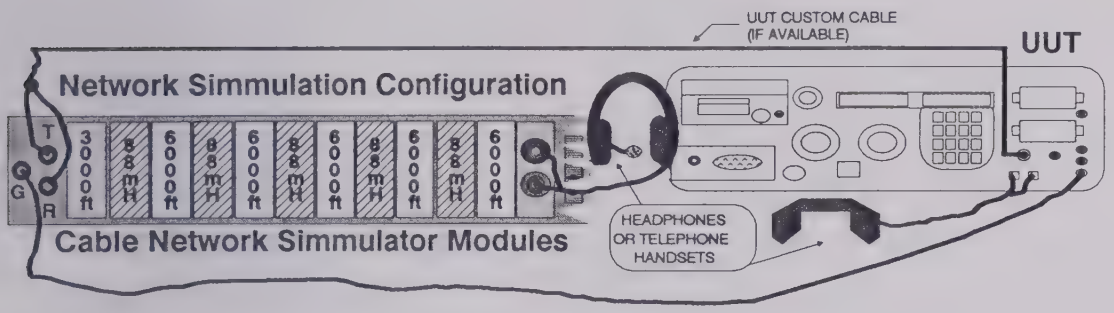


Figure 4-14. Talk Connections Test

4.5.1.2 Press the UUT RESET key.

.3 Disconnect one Headphone/Handset lead(any one) from the UUT.

.4 Set the UUT Volume control to approximately mid range.

.5 Make the following observations and record PASS on the Calibration Data Sheet if all criterion are met:.

1. Re-connect the lead disconnected in step 4.5.1.3 and observe that the UUT generates a tone for approximately three seconds.
2. Observe that total duplex communications (the ability to talk and listen over both Head Sets/Hand Sets) are possible between Head Sets/Hand Sets.

STEP	MEASUREMENT	TOLERANCE
4.5.1.5	TALK CONNECTION TEST	PASS/FAIL

4.5.2 Data Transmission (non-active line) Test

4.5.2.1 Disconnect the Headphone/Handset from the UUT then perform the following UUT key press sequence: STOP, MAN, REF, 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, I.D., AUTO.

.2 Make the following observations and record PASS on the Calibration Data Sheet if all criterion are met:.

1. Observe that the UUT displays: "AC 0123456789*#" (the "#" symbol may have a somewhat different appearance, yet still be recognizable).

2. While monitoring the Head Set/ Hand Set connected to the distant side (side opposite the one connected to the UUT {*Output*}) of the Cable Network Simmulation Modules press the UUT START key and observe that the Touch Tone Data Stream generated by the UUT is audible at a comfortable level over the 33,000 ft - 5 load simmulation.

STEP	MEASUREMENT	TOLERANCE
4.5.2.2	Data Transmission (non-active line) Test	PASS/FAIL

4.6 Metallic Noise Test

4.6.1 Connect the equipment as shown in figure 4-15.

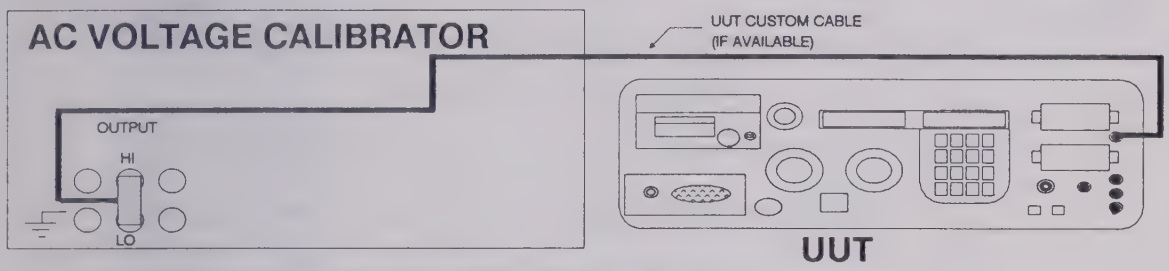


Figure 4-15. Metallic Noise Test

.2 Perform the following UUT Key Press Sequence: ID, MAN, 1, 1, START, OLD, START.

.3 Program the AC Voltage Calibrator to output -41 dBm/600 Ω @ 1 kHz.

.4 Record the UUT indication on the Calibration Data Sheet.

STEP	MEASUREMENT	TOLERANCE
4.6.4	Metallic Noise @ -41 dBm/600Ω, 1 kHz	48 to 50 dBrn

4.7 Insertion Loss Test

4.7.1 Perform the following UUT Key Press Sequence: ID, MAN, 1, 2, OLD.

.2 Program the AC Voltage Calibrator to output 0 dBm/600 Ω @ 1 kHz.

.3 Record the UUT indication on the Calibration Data Sheet.

STEP	MEASUREMENT	TOLERANCE
4.7.3	Insertion Loss @ 0.0 dBm/600Ω, 1 kHz	+/- .50 dB

4.8 Power Influence Test

4.8.1 Connect the equipment as shown in figure 4-16.

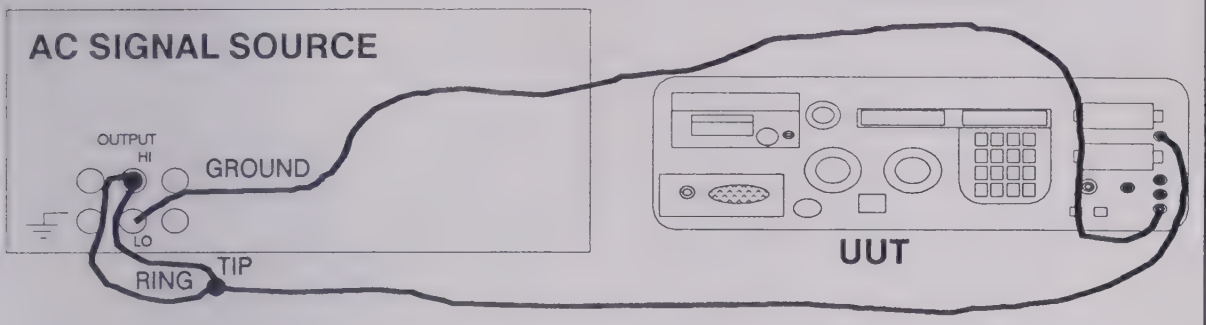


Figure 4-16. Power Influence Test

.2 Perform the following UUT Key Press Sequence: ID, MAN, 1, 1, START, OLD, ID.

.3 Program the AC Voltage Calibrator to output -20 dBm/600 Ω @ 1 kHz.

.4 Record the UUT indication on the Calibration Data Sheet.

.5 disconnect the equipment.

STEP	MEASUREMENT	TOLERANCE
4.8.4	Power Influence @ -20 dBm/600Ω, 1kHz	69.0 to 71.0 dN

5.0 Labels

5.1 Calibration Labels

5.1.1 Observing correct dates, affix the appropriate calibration label to the UUT

5.2 Calibration Void Labels

5.2.1 Affix the "Calibration Void if Seal is Broken" label/s in a manner that will prevent access to the inner UUT or calibration adjustments. Do not cover areas that are designed for user accessibility, such as battery compartments.

6.0 References

6.1 Communications Technology, DaVaR Sysytem III Operations manual

6.2 ESC Metrology Quality Assurance Manual

6.3 The UUT Specifications listed in table 3-1 are a GTE, ERS California, Metrology assigned compilation based on laboratory evaluation, Communications Technology, DaVaR Sysytem III Operations manual, and Communications Technology, "RECOMMENDED SPECIFICATION CHANGE", 6/20/91:jhs. These specifications apply only to firmware revision (D50C = 1.05; D200C = 1.07) or higher with re-calibration. A UUT with an earlier firmware version must be turned in for modification by Communications Technology prior to calibration and subsequent field use.

SERIAL #: _____ STAMP #: _____

BAR CODE: _____ REPORT #: _____

DAVAR 50
CALIBRATION DATA SHEET

MCP STEP NO.	FUNCTION TESTED	NOMINAL VALUE	AS RECEIVED VALUE	AS RETURNED VALUE	OUT OF TOL.	TOLERANCE BAND
4.1	SELF TESTS					
.1.1	SYSTEM TEST	PASS				PASS/FAIL
.1.2	PRINTER TEST	PASS				PASS/FAIL
4.2	AUTO BUZZ TESTS					
2.2.3	OPEN TEST	PASS				PASS/FAIL
2.3.6	BRIDGE TEST	PASS				PASS/FAIL
2.4.4	LOOP-BACK TEST	PASS				PASS/FAIL
2.5.5	SIMMULATED TROUBLES TEST	PASS				PASS/FAIL
4.3	TONE, PROBE, AND TRACE TONE TESTS					
3.1.5	TRACE TONE DETECTION WITH THE AMP PROBE	PASS				PASS/FAIL
3.2.5	SENDING TONE ON OLD PAIR #0 FREQUENCY TEST	PASS				PASS/FAIL
3.2.6	SENDING TONE ON OLD PAIR #0 INTERRUPTION TEST	PASS				PASS/FAIL
3.2.7	SENDING TONE ON OLD PAIR #0 AMPLITUDE TEST	PASS				PASS/FAIL
3.3.3	SENDING TONE ON ALL PAIRS (OLD AND NEW)	PASS				PASS/FAIL
4.4	METERING CIRCUITS TESTS					
4.1.5	0-75 VDC RNG @ 25 V	25.0 VDC				24.8 TO 25.2 VDC
4.1.6	0-75 VDC RNG @ 50 V	50.0 VDC				48.5 TO 50.5 VDC
	0-75 VDC RNG @ 74 V	74.0 VDC				73.3 TO 74.7 VDC
	75-250 VDC RNG @ 80 V	80.0 VDC				78.4 TO 81.6 VDC

COMMENTS:

RIAL #: _____ STAMP #: _____

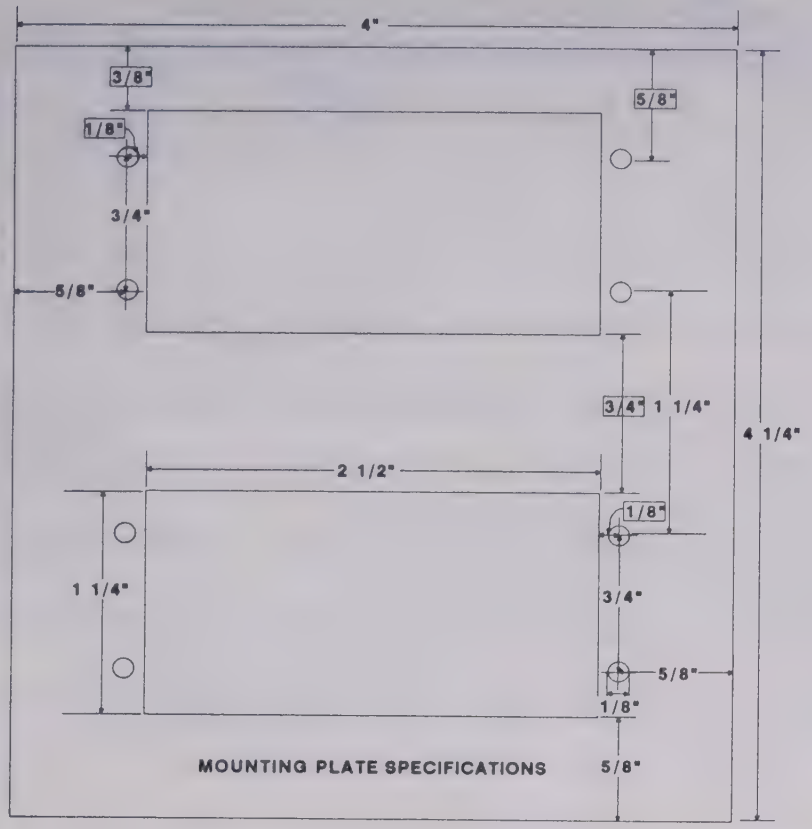
R CODE: _____ REPORT #: _____

DAVAR 50
CALIBRATION DATA SHEET

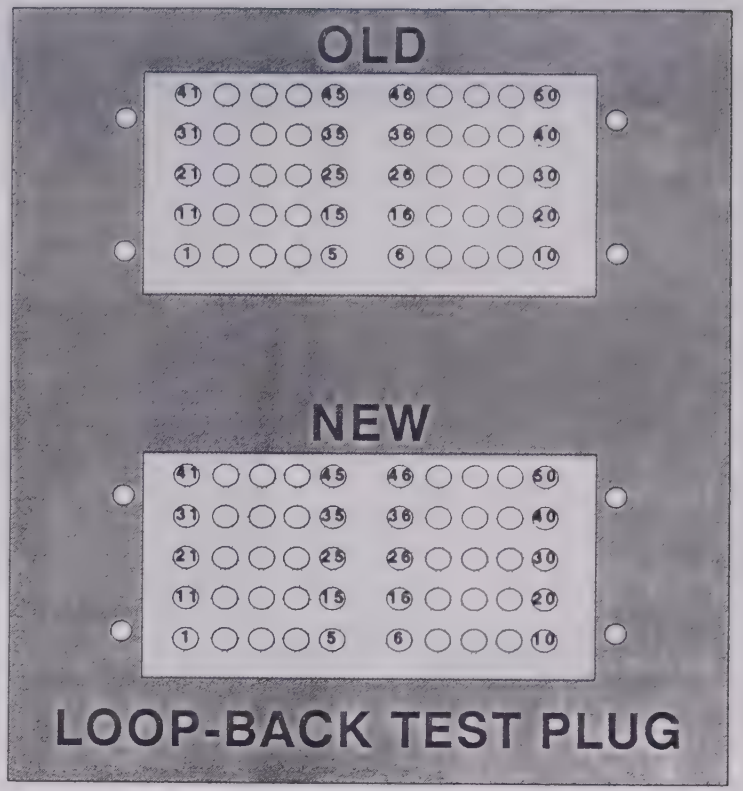
MCP STEP NO.	FUNCTION TESTED	NOMINAL VALUE	AS RECEIVED VALUE	AS RETURNED VALUE	OUT OF TOL.	TOLERANCE BAND
4.4 CONTINUED	METERING CIRCUITS TESTS					
4.1.6 CONTINUED	0-250 VDC RNG @ 245 V	245 VDC				240 TO 250 VDC
4.2.4	0-100K OHM @ 40K OHMS	40.0K OHMS				39.6 TO 40.4K OHMS
4.2.5	0-100K OHM @ 90K OHMS	90.0K OHMS				89.1 TO 90.9K OHMS
	100-330K OHM @ 120K OHMS	120K OHMS				118 TO 122K OHMS
	100-330K OHM @ 200K OHMS	200K OHMS				196 TO 204K OHMS
	100-330K OHM @300K OHM	300K OHMS				294 TO 306K OHMS
	330K-1.5M OHM @ 400K OHMS	400K OHMS				380 TO 420K OHMS
	330K-1.5M OHM @ 1.2 M OHMS	1.2M OHMS				1.14 TO 1.26M OHMS
4.3.9	200 - 8KFT RNG @ 0.0830ufd	5.28 KFT				5.18 TO 5.38 KFT
4.3.10	200 - 8KFT RNG @ 0.0830ufd	.083 ufd				.082 TO .084 ufd
4.4.5	3000 FOOT SPAN SIMMULATOR @ 1000 Hz	Module's True Value				+/- 3% I.V.
4.4.9	6000 FOOT SPAN SIMMULATOR @ 1000 Hz	Module's True Value				+/- 3% I.V.
4.5.6	LOAD COIL MEAS. TEST (THREE LOADS)	PASS				PASS/FAIL
4.5.12	LOAD COIL MEAS. TEST (FIVE LOADS)	PASS				PASS/FAIL
4.5	COMMUNICATIONS TESTS					
5.1.5	TALK CONNECTION TEST	PASS				PASS/FAIL
5.2.2	DATA TRANS. TEST (NON-ACTIVE LINE)	PASS				PASS/FAIL
.6.4	METALLIC NOISE @ -41 dBm, 1 kHz	49 Dbrn				48 to 50 Dbrn
.7.3	INSERTION LOSS @ 0.0 dBm, 1 kHz	.00 dB				+/- 0.5 Db
.8.4	POWER INFLUENCE @ -20 dBm, 1 kHz	70.0 dN				69.0 to 71.0 dN

OMMENTS:

LOOP-BACK TEST PLUG SPECIFICATIONS



MOUNTING PLATE SPECIFICATIONS



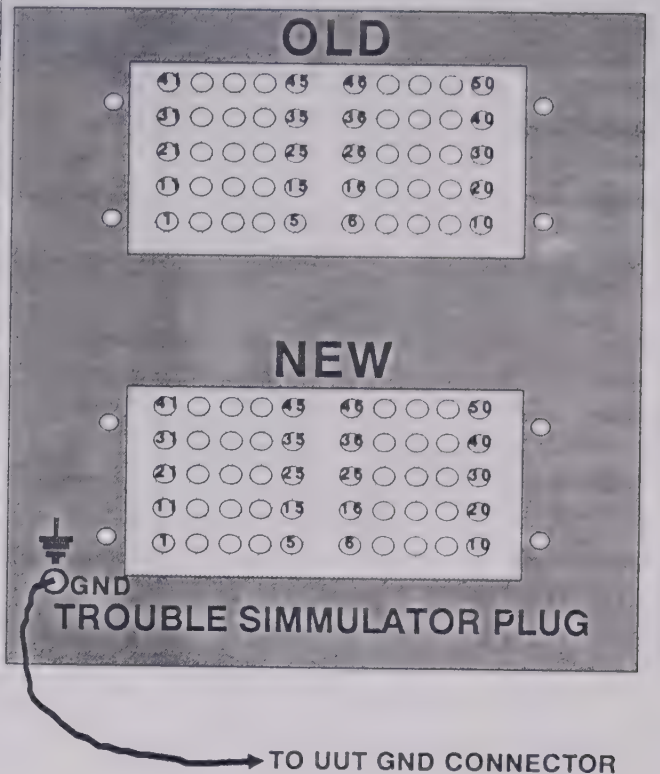
NOTE: ALL CONNECTIONS ARE DIRECT PIN TO PIN (I.e. OLD #1 to NEW #1, OLD #2 to NEW #2)

TROUBLE SIMMULATION PLUG SPECIFICATIONS

REFER TO ATTACHMENT 1 FOR MOUNTING PLATE SPECIFICATIONS

OLD TO NEW CONNECTOR WIRING TABLE
(shaded areas represent pre-configured "troubles")

OLD #50	NEW #50	OLD #40	NEW #40	OLD #30	NEW #30	OLD #20	NEW #20	OLD #10	NEW #10
		10KOHM						TIP & RING TO GND	
OLD #49	NEW #49	OLD #39	NEW #39	OLD #29	NEW #29	OLD #19	NEW #19	OLD #09	NEW #09
		10 KOHM SHORT							
OLD #48	NEW #47	OLD #38	NEW #38	OLD #28	NEW #28	OLD #18	NEW #18	OLD #08	NEW #08
COLOR REVERSAL				OPEN PAIR		TIP TO GND			
OLD #47	NEW #48	OLD #37	NEW #37	OLD #27	NEW #27	OLD #17	NEW #17	OLD #07	NEW #07
OLD #46	NEW #46	OLD #36	NEW #36	OLD #26	NEW #26	OLD #16	NEW #16	OLD #06	NEW #06
		TIP OPEN							
OLD #45	NEW #45	OLD #35	NEW #35	OLD #25	NEW #25	OLD #15	NEW #15	OLD #05	NEW #05
TIP TO RING SHORT									
OLD #44	NEW #44	OLD #34	NEW #34	OLD #24	NEW #24	OLD #14	NEW #14	OLD #04	NEW #02
				RING TO TIP CROSS					
OLD #43	NEW #43	OLD #33	NEW #33	OLD #23	NEW #23	OLD #13	NEW #13	OLD #03	NEW #01
						RING TO GND		TWO PAIRS TRANSPOSED	
OLD #42	NEW #42	OLD #32	NEW #32	OLD #22	NEW #22	OLD #12	NEW #12	OLD #02	NEW #04
OLD #41	NEW #41	OLD #31	NEW #31	OLD #21	NEW #21	OLD #11	NEW #11	OLD #01	NEW #03
		RING OPEN							



CALIBRATION PROCEDURE FOR CAS/DAVAR

REVISED: 6/14/91 ISSUED: 5/17/89

**********CAS/DAVAR SYS III CALIBRATION**********

I. CALIBRATION OF THE PCB ASSEMBLY SET.

A. Install Production Set of PCB Assemblies.

IBRATION)

1. Plug the EXTENDER CARD into the A/D SLOT on the MOTHER BOARD.
2. Mount the A/D PCB ASSY onto the EXTENDER CARD.
3. Place the KNOWN GOOD TEST RX/TX PCB ASSEMBLY into the proper slot on the MOTHER BOARD.
4. Install the rest of the PCB Assemblies, except the RX/TX PCB Assy, into their proper slots.

B. Perform the Final ±9.7 VDC Check.

1. Using a DVM, check for +9.720 VDC at Pin 8 on the Mother Board.

   a. Adjust R13 on the Power Board for +9.720 VDC, as required.

2. Using a DVM, check for -9.720 VDC at Pin 51 on Mother Board.

   a. Adjust R18 on the Power Board for -9.720 VDC, as required.

C. Perform the DC Offset Check.

1. Press [AUTO][PRINT][4][1].

   a. The Display will read TEST 4-1 DC OFFSET.

2. Adjust R5, on the A/D PCB Assy, until the Display reads 0.00 mV ±0.1 mV at TP 3.

3. Press [STOP].

D. Perform the DC Voltage Check

1. Attach a BLUE Power Supply to OLD PR 0.

   a. Select PR 0 with the OLD PAIR and NEW PAIR Knobs.

2. Press [AUTO][PRINT][4][2][OLD][START].

3. Turn the Power Supply ON and set the output to +59.5 VDC.

   a. Display shall read as follows:

      OS XXXX DC XXXX

   b. Adjust R11 for OS 0000.

   c. Adjust R79 for DC ~~200~~. 2021

4. Press [STOP].

5. Press [VOLT][OLD][START]

   a. Check that the Display reads +59.5 VDC:RT.

   b. Reverse polarity and check that the Display reads -59.5 VDC:RT ±.1V.

6. Change the Output of the Power Supply to +5 VDC.

   a. Check that the Display reads +5.0 VDC:RT ±.02V.

   b Reverse the polarity and check that the Display reads -5.0 VDC:RT ±.02V.

7. Change the Power Supply Connection from OLD PR 0 to NEW PR 0.

   a. Press [NEW].

   b. Reset the Power Supply to +59.5 VDC.

   c. Repeat Steps 5a through 6b.

   d. Press [STOP].

E. Perform AC Voltage and Capacitance Readings

1. Press [AUTO][PRINT][4][3].

2. Set the DVM to AC Volts.

   a. Measure the voltage at TP4. *** Write It Down *** (This value is VS).

   What GND is VS value?

   b. *** Multiply VS by 772.348. Write down the result, rounded to nearest whole number. (i.e. 3972.59 = 3973) ***

3. Press [5].

4. If the initial Display reading is OS 0000, turn R29 Counter-Clockwise until the Display reads about OS 0010.

5. Adjust Pots R29 and R77 so that the Display oscillates between OS 0000 and OS 0001, and VS of the value computed in Step 2b.

   a. Adjust both pots in tandem, (as each will affect the outcome of the other), until the desired result is obtained.

6. (N/A)

7. Press [4].

   a. Display shall read as follows:

      BAL XXXX VD XXXX

   b. Adjust R91 for minimum BAL reading on display.

   c. Press [STOP].

8. Press [CAP][OLD][START].

   a. Connect Cap. Decade Box to Old Pair 0.

   b. Select the following cap values for the Cap Box and verify the CAS/DAVAR readings are within Manufacturing Specifications.

.004 µF	
.010 µF	
.050 µF	
.100 µF	
.500 µF	
1.00 µF	

   c. Press [STOP].

9. Press [ID][5][OLD][1000][START].

   a. Connect the Cap. Box and Res. Box in series to Old Pair 0.

b. Select the following cap and resistance values from the Cap. Box and Res. Box and verify the CAS/DAVAR readings are within Manufacturing Specifications.

R Box	C Box	Z
1200 Ω	1.30 µF	1.21K Ω
400 Ω	.30 µF	664 Ω

c. Press [REF][500][START].

850 Ω	1.20 µF	890 Ω
1400 Ω	.50 µF	1.54K Ω

d. Press [REF][1500][START].

900 Ω	.50 µF	924 Ω
1000 Ω	.20 µF	1.13K Ω

e. Press [STOP].

F. SET R93 RESISTANCE VALUE:

1. Connect the TIMS to the Attenuator and the Attenuator to OLD PR 0.

2. Connect a Resistance Decade Box to R6, (left side), and the bottom hole of R93's position on the board.

   a. Set box to 0.00 Ohms.

   into output load?

3. Turn TIMS to ON and the Output to 10db at 1004Hz.

4. Press [AUTO][PRINT][START][START].

5. Press [I][D][MAN][1][2][OLD].

6. Adjust Attenuator & TIMS to 100 mV AC at Pin 80 on Mother Board

7. With DVM on DC voltage adjust Resistor Decade Box to 0.00 volts at TP13 (A/D PCB Assy).

8. *** Note R box setting and subtract 500K Ohms. *** (This is the value for R93.)

9. Remove A/D PCB Assembly from Extender Card.

10. Select a resister CLOSEST to the value computed in Step 8, above, and solder to A/D PCB Assembly at R93. (USE CORRECT RESISTOR TYPE)

G. Set Decibel Pots:

1. Attach TIMS to Attenuator and Attenuator to PR 0.
2. Press [AUTO][PRINT][START][START]. IVCHE
3. Press [ID][MAN][1][2][OLD].
4. Adjust TIMS/Attenuator for 2.00 VAC at Pin 80 on the Mother Board.
5. Readjust Attenuator, (usually a 20db change), for 200 mVAC at Pin 80 on the Mother Board.
   a. You should now be able to change between 2.00 V and 200 mV by merely adjusting the attenuator db setting.
6. Set DVM to DC. With the Attenuator set for 200 mV adjust R35 to 1.50vdc ±.05 VDC, measured at TP13 on the A/D PCB Assembly.
7. With the Attenuator set for 2.00 VAC, adjust R95 to 6.5 VDC ±.05 VDC, measured at TP13.
8. Repeat Steps 6 & 7 until no further adjustment is required to bring these measurements into the proper range.
9. Press [STOP]. (will not restore need to press reset)

H. Set R105 Value:

(PCB 352-2136-0001 Rev. NR)

1. Unsolder the top lead of R57 and lift it from the board.
2. Attach a Resister Decade Box in Series with R57. (This will be called RB1.)
3. Attach a second Resistor Decade Box to OLD PR 0. (This will be called RB2.)
   a. Set RB2 to 20K Ohms.
   b. Press [RES][OLD][START].

4. Adjust RB1 until Display reads 20 Kr:RT.

5. *** Note setting *** This is the resistance value needed for R105.

   a. Find the closest value resistor to this setting and solder it into place in series with R57. (USE CORRECT RESISTOR TYPE)

6. Range through the values for RB2 noting readings. These readings should be within Manufacturing Specifications for each reading.

(PCB 352-2136-0001 Rev. A)

1. Attach a Resistor Decade Box to OLD PR 0.

   a. Set R. Box to 20K Ohms.

   b. Press [RES][OLD][START].

2. Adjust R105 until Display reads 20 Kr:RT.

3. Range through the values between 0 and 1.5M ohms with R. Box. These readings should be within Manufacturing Specifications for each reading.

II. Calibration of Rx/Tx

A. Remove the test Rx/Tx PCB Assembly, and the Extender Card from the Mother Board.

   1. Place A/D PCB Assy into proper slot on the Mother Board.

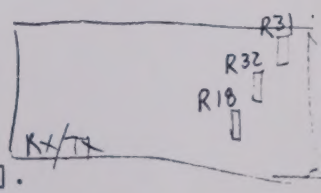
   2. Place Uncalibrated Rx/Tx PCB Assy into proper slot on the Mother Board.

B. Set Noise Metallic use 3550

   1. Attach TIMS to Attenuator and Attenuator to OLD PR 0.

   2. Set TIMS Output to ~~10~~ 0db at 1004 Hz.

   3. Set Attenuator to ~~75~~ 60 db.



   4. Press [ID][MAN][1][1][START][OLD][START].

   5. Adjust R18 so that the Display shows 30 dbRN

   6. Press [STOP].

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